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ABSTRACT

A comprehensive listing is provided of the specific needs for research on instructional systems development which have been identified by the authors of 2,692 pertinent articles. These articles were selected and abstracted for a basic file of technical information on instructional system development. Since some articles date back as far as 1953, they may no longer be relevant, but no attempt has been made to reflect the degree of current significance in this compendium. The needs are categorized by the following principal instructional system development activities: 1) the determination of job performance requirements; 2) the specification of training requirements; 3) the establishment of criterion objectives; 4) the development of criterion-referenced tests; 5) the selection of media and methods; 6) the development of instructional materials; and 7) the evaluation of instructional programs. Each of these seven major categories is broken into subcategories and within these smaller units the research needs are listed chronologically by publication date. (Author/LB)

AIR FORCE



**HUMAN
RESOURCES**

**A COMPENDIUM OF RESEARCH
AND DEVELOPMENT NEEDS
ON INSTRUCTIONAL SYSTEM DEVELOPMENT**

By

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**ADVANCED SYSTEMS DIVISION
Wright-Patterson Air Force Base, Ohio 45433**

February 1974

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LABORATORY

**AIR FORCE SYSTEMS COMMAND
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This technical report has been reviewed and is approved.

GORDON A. ECKSTRAND, Chief
Advanced Systems Division

Approved for publication.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This memorandum provides a comprehensive listing of specific needs for research on instructional systems development, as identified and noted by the authors of 2,692 related articles. The articles from which the needs were taken had been selected and abstracted for a basic file of technical information on instructional system development. Because the items date as far back as 1953 some, of course, may no longer be relevant but no attempt was made to reflect degree of current relevance in this listing. The needs are categorized and listed by principal system development activities and, in turn, by more specific subsidiary concerns.		

PREFACE

This report was prepared by Applied Science Associates, Inc. (ASA), Valencia, Pennsylvania, under Air Force Contract F33615-72-C-1884. The work described herein was accomplished under Project No. 7907, Conditions of Effective Training and Transfer. The project was administered by the Advanced System Division, Air Force Human Resources Laboratory. From contract initiation on 15 June 1972 through 31 December 1972, the Technical Monitor was Horace H. Valverde (now retired). Dr. Theodore E. Cotterman assumed the Technical Monitorship of the contract for the final months of the effort. Sanford P. Schumacher was the Principal Investigator.

This compendium, one of four reports prepared under the contract, is a technical report¹. The suggestions for additional research in this compendium were noted by authors of works abstracted for a technical data file on instructional system development. The process of developing the technical data file is described in a final technical report².

The authors wish to express their gratitude to the many people who helped in developing and preparing the compendium. Abstractors including Jan Berlin, Sylvia Sue d'Ambrosi, Christine Doll, Peter Fehrenbach, Kenneth Hausman, Susan Koh, Gale Kornhauser, Jane Reynolds, Kathryn Sharretts, Ann P. Smith, Elissa Weidaw, and Marlo Wiggans, identified and condensed the needs as originally expressed by the authors. Fred Schroyer and Kim Long edited the first draft of the compendium. Special thanks are also due Ann Kocher, Deborah Schultz, and Ethel Westerman who typed the compendium.

¹The second technical report is: Schumacher, S.P., Pearlstein, R.B., & Martin, P.W. A comprehensive key word index and bibliography on instructional system development. AFHRL-TR-74-14. Wright-Patterson AFB, Ohio: Advanced Systems Division, Air Force Human Resources Laboratory, February 1974.

The third technical report is: Schumacher, S. P., Swezey, R. W., Pearlstein, R. B., & Valverde, H. H. Guidelines for abstracting technical literature on instructional system development. AFHRL-TR-74-13. Wright-Patterson AFB, Ohio: Advanced Systems Division, Air Force Human Resources Laboratory, February 1974.

²The final technical report is: Schumacher, S. P. Development of a technical data file on the design and use of instructional systems. AFHRL-TR-73-41. Wright-Patterson AFB, Ohio: Advanced Systems Division, Air Force Human Resources Laboratory, December 1973.

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INTRODUCTION

This compendium contains a classification of the author-generated "suggestions for additional research" from the literature which was abstracted under Air Force Contract No. F33615-72-C-1884. These research and development needs were initially categorized under the nine major ISD activities listed in the Handbook for Designers of Instructional Systems³. Each of these nine major categories was then further subdivided, if the number and nature of the research suggestions permitted more specific classifications. Following is a brief description of the major ISD activities:

1. Determine Job Performance Requirements (JPRs). The process of determining the tasks required of the human component, and the standards of performance. This process applies to all types of "jobs." It results in a statement of all human activities (skills, knowledges, and attitudes) required for successful performance.
2. Determine Training Requirements (TRs). The process of determining the changes needed in skills, knowledges, and attitudes of personnel, so they can perform a job. These changes, when added to the entering repertoire of abilities, must meet the JPRs.
3. Determine Criterion Objectives. The process of specifying the objectives which the student must meet to satisfy the TRs. Criterion objectives specify precisely what behavior is to be exhibited, the conditions under which behavior will be accomplished, and the minimum standard of acceptable performance.
4. Develop Criterion-Referenced Tests. The process of developing and administering tests which directly measure the criterion objectives. The survey test is administered to samples of prospective students. The purpose is to verify which skills and knowledges to include in the course of instruction. Criterion-referenced tests (course criterion tests and diagnostic tests) are also developed to determine if the behaviors in the criterion objectives have been acquired.

³Department of the Air Force. Handbook for designers of instructional systems. Washington, D.C.: June 1973. AFP 50-58.

5. Select Media/Methods. The process of selecting appropriate media and methods for each block of instructional objectives. Selection is based on:
 - a. Practical constraints (such as financial considerations)
 - b. Instructional nature of the objectives (certain behaviors may be important in training, but not on the job)
 - c. Presentation mode implied by the objectives (visual, auditory, etc.)
 - d. Type of learning involved (for example, simple visual discrimination; chain of skilled performances)
 - e. Best instructional sequence for the objectives.
6. Develop Instructional Materials. The process of developing and integrating the actual materials which make up the instructional regimen.
7. Validate and Revise Instructional Materials. The process by which each unit of instruction is tested (validated) as it is developed. This process insures that criterion objectives are satisfied. First, materials are tested on several individuals and revised as necessary. Then, they are tried out on small groups of students, carefully sampled from the potential student population. Final revisions are made.
8. Conduct Instructional Program. The process of implementing and administering the instructional program. This includes training of instructors and scheduling as well as the actual conduct of the program.
9. Evaluate Instructional Program. The process of determining the extent to which graduates of the instructional program satisfy the performance requirements in the job environment. Detailed records of graduate performance are kept, and changes to the instructional program are recommended as necessary.

The major category "Conduct Instructional Program" has been omitted from this classification scheme. After reviewing all of the research suggestions and classification sections, it appeared that none of the research needs directly related to that topic; rather most were indirectly applicable. Instead of classifying all indirectly related suggestions, a decision was made to omit this category entirely and to categorize the suggestions in the areas where they were more directly relevant. Also,

for the same reasons, research needs which might have been classified in the major category, "Validate and Revise Instructional Materials," have been listed under the appropriate subheadings of the major category, "Evaluate Instructional Program."

Within each category, the research needs are listed chronologically (according to publication date). Whenever a research suggestion was judged to be equally applicable to more than one category, the suggestion appears under each applicable category. The number in parentheses at the conclusion of each item are the bibliographic file sequence number and the year of publication. These references are provided because although many of the listed suggestions can be understood as presented in the compendium, others are difficult to interpret outside of the context of the original document. It is suggested, therefore, that the user who intends to follow up on a suggested research item, return to the original document (or its abstract) to determine the precise context of the recommendation. The complete bibliography of titles from which this compendium was drawn is presented in a companion document.⁴

⁴Schumacher, S. P., Pearlstein, R. B., & Martin, P. W. *A comprehensive key word index and bibliography on instructional system development*. Dayton, Ohio: Air Force Human Resources Laboratory, Wright-Patterson Air Force Base, February 1974, in press. AFHRL-TR-74-14.

DETERMINE JOB PERFORMANCE REQUIREMENTS (JPRs)

The following research suggestions are of use to the performance analyst who must carefully observe, analyze and classify those activities which are required to perform the task. It is suggested that research be conducted not only on present JPRs (task descriptions, performance requirements and task classification), but also on future performance requirements that may result from technological advances.

A. Task Descriptions

Research into the nature of abilities required for tracking tasks, or other tasks of similar complexity. (2309/1961)

Research into multidimensionality and changes over time, which were felt to be two characteristics of job performance criteria needing further attention and investigation in connection with matters of criterion reliability and predictability. (348/1963)

Research to establish reliability of the task analysis method. (176/1964)

Research in long-range improvements in Task Analysis and Training Situational Analysis, specifically "experimental work on characteristics of performance and on relationships between task attributes and training requirements. The immediate need is for integration and systematic tryout and testing of the present Training Situation Analysis techniques." (176/1964)

Research to provide a sound foundation in the experimental analysis of human academic learning. (976/1972)

B. Performance Requirements

Analysis of the interrelationships among component performance measures of other complex jobs, to possibly provide one way of defining the ability requirements underlying proficiency in those jobs. (2269/1960)

Further research into the nature of abilities required for tracking tasks or other tasks of similar complexity. (2309/1961)

Research attempting to relate ability factors (as described by Fleishman, 1964, 1965b) to performance on the task factors identified in this study (Locke, Zavala, and Fleishman, 1965). (1089/1965)

Studies to define training effects as a function of differing methods, media, and schedules applicable to the training system. (512/1966)

More data collection on human performance in tasks and situations highly representative of the pilot's job under conditions found in flying. (512/1966)

Regular, periodic evaluation of the relevance of technical curricula to the educational input into the labor market. (1104/1970)

C. Classification of Tasks

Continuation of methodological research to extend the basic capabilities of job-standard definition; investigation of required allocation techniques and devising of an Index Of Task Accomplished (IOTA) describing stable characteristics of a system, including man; and integration of maintenance considerations into the job standards method. (219/1964)

Research on how the cognitive and effective domain of the taxonomy of educational objectives and the classification of capabilities by Gagné are related. (2186/1965)

Development of an empirically grounded and logically sound taxonomy covering a wide range of learning situations. (485/1966)

Research into these areas: (1) Refinement of the task classification system, (2) experimentation to determine reliability, consistency, and effectiveness of strategies prescribed for different task types, and (c) final test of the taxonomy of response processes by practical application. (24/1969)

Research on the task and cognitive variables which are relevant to performance, and ways of manipulating these variables. (2236/1969)

D. Predicting Future Performance Requirements

Research into multidimensionality and changes over time, which were felt to be two characteristics of job performance criteria needing further attention and investigation in connection with matters of criterion reliability and predictability. (348/1963)

Research to develop more refined forecasting techniques, especially those used to identify the impact of technological changes on skill requirements and demand for labor. (1104/1970)

DETERMINE TRAINING REQUIREMENTS (TRs)

The following research needs suggest methods for determining the needed personnel skills, knowledges, and attitudes that are prerequisite to performing a job.

Further research on whether a test of ability to follow instructions has value in predicting a significant part of a particular criterion complex. (988/1961)

Research in long-range improvements in Task Analysis and Training Situational Analysis, specifically "experimental work on characteristics of performance and on relationships between task attributes and training requirements. The immediate need is for integration and systematic tryout and testing of the present Training Situation Analysis techniques." (176/1964)

Development of a single intercorrelation matrix including all qualitative variables available for prediction of student success in flight training to determine their total contribution to the multiple prediction formulae. (1332/1966)

Preparation of an inventory of organized skill development programs carried out by formal institutions, the military, trade unions, etc. (1810/1966)

DETERMINE CRITERION OBJECTIVES

Although the topic is widely discussed, and procedures often given, few research needs were found in this area.

Research on how the cognitive and affective domain of the taxonomy of educational objectives and the classification of capabilities by Gagne are related. (2186/1965)

Research to identify desirable changes in student behavior, and determination of the effects of new question strategies. Researchers should give "high priority" to these tasks. (1110/1970)

The author recommended working toward a situation in which instructional objectives and student characteristics determine the instruction strategy, which, in turn, determines the procedures for implementation of learning exercises. (1293/1970)

Research to explore ways to maximize the effects on learning of complex combinations of variables, including objectives. (2165/1972)

DEVELOP CRITERION-REFERENCED TESTS

Research is needed in the areas of test construction and validation. Research is also suggested to determine related effects of testing.

A. Test Construction

Experimentation with alphabetical item arrangement, and arrangement according to the printed length of the option of multiple-choice items. (947/1952)

Development of a code aptitude test emphasizing the factors of Dot Estimation and End-element Substitution, since these two factors contribute the most errors. (2205/1955)

Additional studies of the true-false formula using various kinds of subject matter and items at various levels of difficulty. Tape recordings of the verbalized introspections of a group of examiners might serve as a means of obtaining data. (2259/1959)

Research to determine whether there is a relationship between organization and better recall on a free recall test. (2560/1962)

Experimentation with reading comprehension measures that employ formats other than multiple-choice questions. (1781/1964)

Research using replication of the present study, in which student-constructed test performance is compared with performance on teacher-constructed tests, but with the addition of another group in which the Ss submit items but are then given a teacher constructed examination; and a study of the effects of student expectation on actual test performance. (839/1965)

Study in the areas of further validation of Bloom's taxonomy; item analysis data; knowledge as process; triangular bivariate distributions; norms for taxonomy-type tests, items, and pyramid tests. (528/1966)

Research in school settings in which attempts are made to develop and test instructions designed to facilitate concept learning in various subject fields. (1403/1968)

Research on construction and validation of reliability criterion measures and on environmental influences on success. (1716/1968)

Research to determine: (1) How one can manipulate the debilitator's performance upward by use of psychometric strategy; (2) whether the effects found here are constant across various examination situations and across

Investigation of the relationship between test difficulty and study efforts and achievement, since the only two studies in this area have equivocal findings. (1975/1969)

Further study of the method of measuring the effectiveness of materials, and the extent of structure in materials themselves. (1983/1969)

Research on the task and cognitive variables which are relevant to performance, and ways of manipulating these variables. (2236/1969)

Research into the post-passage review or "backward" hypothesis of learning--i.e., that questions inserted into a unit of instruction motivate the student to review the preceding material in that unit. (1932/1971)

Research into the efficacy of the forward or shaping influence hypothesis--i.e., that questions inserted into a unit of instruction influence the way in which further materials in that unit are studied. (1932/1971)

Research to explore the effects of knowledge of quiz results on types of learning other than memory of factual data, such as application, synthesis, analysis, and interpretation of facts and principles. (____/1972)

C. Test Reliability and Validity

Research to see if content validity is contingent upon the value judgments of those individuals who are defining the term "validity." (2544/1965)

Study in the areas of further validation of Bloom's taxonomy; item analysis data; knowledge as process; triangular bivariate distributions; norms for taxonomy-type tests, items, and pyramid tests. (528/1966)

Conduct of additional validation studies on the Instructional Objectives Preference List. (745/1967)

Research on construction and validation of reliability criterion measures and on environmental influences on success. (1716/1968)

Research to determine: (1) How one can manipulate the debilitators' performance upward by use of psychometric strategy; (2) whether the effects found here are constant across various examination situations and across various kinds of test formats such as completion, matching, recall, etc.; and whether it is feasible to unobtrusively program an examination by the use of easy and/or difficult items. (1880/1968)

Research on these assumptions in computer measuring of essay traits: (1) Test whether the category definitions used are adequate to the task of inducing uniform, reliable grading behavior within and between judges; (2) test the validity of the items chosen to represent the traits; (3) determine the extent to which the correlations fluctuate with the essay topic; (4) determine if these correlations will be obtained among different skill levels. (1981/1969)

Investigations to compare the discrimination and power of two, three, four, and five alternative multiple-choice items. (1992/1970)

Research on a more reasonable construct validation approach could be based on a contrast between: (1) Instructors who had manifested measurable skill in promoting learner attainment of prespecified objective, and (2) instructors who had not measurably manifested such a skill. (1649/1971)

Further research to determine whether the present finding can be generalized beyond the Likert-type scale to different types of scales (e.g., Osgood's Semantic Differential, Thurstone-type scales, graphic rating scales, etc.), and other purposes (e.g., the rating of behavior, personality, industrial word performance, etc.). It should also be determined whether the conclusions are generalizable to different S populations defined by such parameters as level of education or ability, and by psychological, experimental, demographic, and ecological characteristics. (1988/1971)

Research into the effects of leniency in grading essays, especially how it varies over time. (2568/1971)

SELECT MEDIA/METHODS

Research needs relating to media have been categorized according to media type. Needs related to instructional methods are further divided for each specific method. Also included is a final category of research needs specifically related to media comparisons.

A. Audio Devices

Research to determine the extent to which discussion periods led by the instructor are necessary for clarification purposes in conjunction with tape recorded lecture courses. (2305/1961)

Studies of: (1) critical listening; (2) the relationship between specific listening and reading abilities; (3) ways of exploiting possible relationships for teaching purposes; (4) teaching techniques and materials; (5) personality factors which may influence listening; (6) ways in which listening to instruction affects behavior; and (7) measuring devices in listening. (1684/1967)

Studies into the relationships between listening research and linguistic research. (1684/1967)

Research in these areas of time-compressed speech techniques: (1) Which types of educational material are most suited to time-compressed speech presentations? (2) What specific student characteristics interact most closely with the comprehension of time-compressed speech? (817/1968)

Further research to determine the effectiveness of oral versus visual presentation of learning materials, as measured by delayed retention of four, eight, and twelve weeks duration. (1600/1968)

Investigation of the possibility of using time saved by speech compression to improve overall learning. (967/1971)

Research on incorporation of visual materials into a program of speeded-speech tapes. (1576/1971)

Research to determine the maximum length of messages to which Ss can listen at given rates without significant losses in comprehension. (2597/1971)

B. Visual Devices

Research oriented toward a systematic evaluation of visual instructional media. This evaluation should be focused on the relative effectiveness with which the different types of visuals, possessing varying amounts of realistic detail, facilitate student achievement of specific educational objectives. (700/1970)

Research on incorporation of visual materials into a program of speeded-speech tapes. (1576/1971)

Research to explore the relationship on procedure learning of the factors of unfamiliar movements and verbal codable movements with moving and still sequences. (2195/1971)

Further research to identify more precisely whether learning is affected by the choice of either printed or projected images. (940/1972)

C. Audio-Visual Devices

Research on the pacing of films which require participation and on the increase in learning resulting from mental practice of skills demonstrated, information communicated, or questions asked during or after a film showing. (2270/1957)

Research to determine the most appropriate time and the most receptive student populations for the use of instructional television-classroom settings. (423/1962)

Research to determine how a visual image affects learning, i.e., by providing a sense of actuality which serves as a stimulus, or by implying a question which the sound track answers. (2235/1962)

Research to determine how many statements can be attached to a single image or related images before the teaching effect of the image wears out. (2235/1962)

Research to test the retention of materials over varied intervals, when a learning film does not reproduce on the screen the material in the sound track. (904/1963)

Evaluation of how many statements can be attached to a single picture or related pictures before the teaching effectiveness of the image diminishes. (2466/1963)

Research into these areas: (1) what forms of individual participation of students involved in CCTV instruction can be used with large groups of students? (2) are there differences in the effectiveness of various forms of individual participation? (3) can individual participation

activities be developed so that they not only enhance recall but also develop problem-solving abilities? (4) what is the effectiveness of individual participation in subject areas other than science, and with students not on the junior high school level? and (5) what means, in addition to forced attention, can be employed to promote greater involvement with a televised instruction presentation? (841/1965)

Investigation of these questions: (1) what individual differences affect the extent to which Ss are capable of comprehending visual and/or auditory modes of presentation? (2) to what extent does familiarity influence the ability to comprehend material presented at high rates of speed? (3) what are the effects of practice on the comprehension of high-speed auditory presentations of meaningful material? (835/1966)

Additional research to determine the feasibility of telecasting a videotaped study-skills course to university residence halls, libraries, and student lounges. (992/1967)

More research on the effectiveness of the "Common Learning" television course. (2453/1967)

Investigation of the permanency of the effect produced by a propaganda argument delivered by a live or videotaped presentation. (729/1969)

Investigation of the amount of information retained from a television presentation as compared to a live presentation. (729/1969)

Further investigation of the use of TV in instruction, to possibly include: (1) direct and indirect feedback, (2) multiple instruction, and (3) TV case studies. (1248/1969).

More research in instructional television, using intercorrelations among post-test scores. (696/1971)

More research in ITV using post-test totals instead of student-totals. (696/1971)

Research replicating this study of the effectiveness of a videotaped model, but treating each S as an individual--allowing the S to view the model or movie alone. (1949/1971)

Research to determine if viewing a videotaped model several times can enhance the model's lasting effect. (1949/1971)

Research to determine what effect there would be on specific behavior if a videotaped model was accompanied by comments made by an authority. (1949/1971)

Research on the effective use of video cassettes in both educational and industrial applications. (681/1972)

Media comparison studies using many of the unique contributions of TV simultaneously, rather than a single dimension at a time. (698/1972)

More detailed investigation of the relationships of visual TV communications techniques to theoretical models of perception and learning. (698/1972)

Testing of color vs. black-and-white effects on learning, opinion, and attention with other stimuli, other media, and other methods of observing the attention variable (such as recording eye movements). (714/1972)

Further research through replications of this study (which investigated the relative efficacy of advanced organizers, postorganizers, interspersed questions, and combinations thereof in facilitating learning and retention from a televised lecture). One replication should involve the same experiment at a higher school level. Another should be changed only to use simpler organizers. Another should utilize the video-scripts as written learning material. (1953/1972)

Further research on the instructor, content, and student variables in TV classes. (2158/1972)

Further research on audible multi-imagery, to examine: whether it is most efficient with certain age groups; what the most efficient career size is; what subject matter is best taught by this method; how it can be used to help children with reading problems; whether learning is better with or without class discussion paired with AMI; how AMI is related to individual differences; what role incidental learning plays in AMI. (2313/1972)

More extensive investigation into the relationship between stimulus intensity and vocabulary learning. (2657/1972)

D. Visual Aids

Further experimentation on the use of tachistoscopes and reading rate controllers in regard to test performance, eye-movement, age, intelligence, and personality patterns. (2075/1953)

Research on whether the use of visual aids leads to greater uniformity of performance in students. (405/1956)

Research to determine how a visual image affects learning, i.e. by providing a sense of actuality which serves as a stimulus, or by implying a question which the sound track answers. (2235/1962)

Research to determine how many statements can be attached to a single image or related images before the teaching effect of the image wears out. (2235/1962)

Studies to examine the influence of response-dominance levels upon the attainment of concepts, when the stimuli are words, pictures, and combinations of words and pictures. (2159/1964)

Further research on the use of pictorial embellishment in instructional programs. Do the advantages in improved enjoyment for the student justify the added cost of such materials? (1552/1965)

Investigation of ocular movements in relation to display complexity and as a function of practice. (1102/1966)

Research to test the effectiveness of television as a group screening method, utilizing a broader sample than the grade-school-age group employed in this study. (1427/1967)

Computerization of the "projection tree," or adaptation of it to multiple rear-screen setups, or even multiple projection-tree systems. (1891/1967)

Further research on the following areas: (1) what kinds of subject matter are most appropriate for use of the overhead projector? (2) what student characteristics would indicate particular receptivity to the use of the overhead projector as a supplement to instruction? and (3) to what extent does the use of visual aids engender an "illusion of learning" among students? (2151/1967)

Further research on the effects of visual instruction on delayed retention. (1461/1969)

Research oriented toward a systematic evaluation of visual instructional media. This evaluation should be focused on the relative effectiveness with which the different types of visuals, possessing varying amounts of realistic detail, facilitate student achievement of specific educational objectives. (700/1970)

Studies on the effects of pictures on attitudes. More specifically, can the use of texts having illustrations that are multiethnic change students' attitudes? (1042/1970)

Research for a graphic image facility, to record, or capture the signal impulses representing graphic information or line-drawing content, and to store this information on one of the tape tracks to be programmed over one channel of the system, while another track carries the audio or verbal information. (2366/1970)

E. CAI

Further research on an information-retrieval system, which would also involve research on automatic abstraction, coding, and dissemination of information. (939/1963)

Research on the kinds of information needed by students, teachers, counselors and administrators. Also, development of more standardized methods for coding and recording this information, so that high-speed processing techniques can be used efficiently. (972/1963)

Further research on the use of the student-response computer system to answer questions about the lecture situation. (2344/1966)

Replication of the present study comparing CAI instruction with traditional programmed text instruction, using a sample population other than the junior high school students used in the present study, would aid in the generalizability of present findings. (1922/1967)

Validation of the credibility of CAI materials. (671/1968)

Systematic research on the relative effectiveness of analogical and digital modes of representation, as these relate to the content of the instructional message, to communicator and learner characteristics, and to the physical and psychological aspects of a particular medium or combination of media. (1718/1968)

Research on the use of computer-managed instruction in post-graduate training and review. (2492/1968)

Application of research to design, and determine validity of, instructional techniques and languages which would become available upon acquisition of a computer-based instructional system. (660/1970)

Investigation of available mini-computers to determine the best unit for interfacing non-standard terminals and peripherals to various main-frame hardware. (660/1970)

Further research into the use of small computers and computer materials in specific application areas. (1287/1970)

Further research on CAI to investigate the relationship between time taken to complete a CAI program and scholastic achievement. (1588/1972)

F. Programmed Instruction

Research on what can be used to compensate for the loss of the review-of-errors procedure in programmed learning. (2265/1961)

Further consideration of the multiple-choice type of question in programmed instruction. (2561/1961)

Research in PI, focussed on criterion-specification and measurement (not on methods of presentation). Required are: (1) a generalizable method of experimental research which can be applied to the diversity of educational products (via learning objectives); (2) a common denominator upon which comparison between PI and conventional instruction can be made (i.e., time or money); and (3) a baseline value that is standardized for use across all modes of instruction and will serve as the criterion against which instructional results can be measured. (86/1962)

Research to answer the following questions: (1) what is the effectiveness of programmed instruction as compared with traditional instruction? (2) how adaptable is programmed instruction to changes in course content and curriculum? (3) how responsive can programmed instruction be to individual student differences? (4) in what ways does programmed instruction influence student motivation and intent? (5) what is the extent of transfer and generalizability of material presented through programmed instructional methods? and (6) do learning gains stemming from programmed instruction justify the additional expense of purchasing the necessary machines and programs required to institute this approach in a general educational setting? (780/1962)

Research to test various reinforcement schedules separately on individual concepts within programmed instruction, regardless of the concept's order in the total program. (807/1962)

Further research to determine the effect of intermittent confirmation on delayed as well as immediate retention following programmed instruction. (807/1962)

Research to test various reinforcement schedules separately on individual concepts within programmed instruction, regardless of the concept's order in the total program. (807/1962)

Research to determine the exact parameters of retention over time and the corresponding advantages of overt responding. (813/1962)

Examination of the extent to which students actually attend to the context of the programmed response. (1339/1962)

Investigation into the amount of additional time expended by students receiving the confirming response to programmed material "in context." (1339/1962)

Investigation of three categories of potentially relevant factors for programmed instruction: the length of the program, the complexity of its content, and the ability level of the learner using a particular programming format. (1345/1962)

Research comparing the relative efficiency of overt-versus-covert response modes in programmed instruction utilizing error rate as an independent variable and persistence of wrong responses as a dependent variable. (1659/1962)

Examination of scrambled-versus-ordered sequence with programs of different length, in different subject areas, and with students of various age levels. (1795/1962)

Further research to determine the relation of accessibility of information, as determined by presentation mode, to mastery of programmed subject matter. (1904/1962)

Further research to study the interaction between IQ and programmed instruction presentation mode. (1904/1962)

Further research utilizing a programmed logic task to investigate the relation between response complexity and implicit responding. (1906/1962)

Research in the area of programmed instruction, with particular emphasis on bypasses and remedial circuits. (1908/1962)

Further research to determine whether programmed instruction affects various ability levels differently. (1910/1962)

Further research to determine whether differences occur in student performance resulting from linear-versus-forward-branching programs, if the branching procedures used are highly complex. (1912/1962)

Examination of the scrambled-versus-ordered sequence question with students of various age levels, with programs of different length and in different subject areas, and with retention tests made at spaced intervals of time. (1920/1962)

Investigations to study Ss performance in a programed sequence on foreign language as a function of the mode of item presentation and response. Three "modes" that require experimental comparison are: (1) reading the frames only, (2) writing the foreign word when it appears, and (3) writing the foreign word when it appears with its pronunciation having been presented once. (1390/1963)

Research to determine whether lower-performing students, who receive additional training and consequently improve their scores, retain as much as students who scored high originally. (1394/1963)

Further research on the selective pairing of students in the use of programmed materials. What basis for selection yields the most improved learning and retention? (1394/1963)

Research on the following question: Once an adequate sequence of programmed materials is developed, can those materials be presented equally effectively by machine and text? (1398/1963)

Further research on the problem of individual differences in performance on programmed instruction and the implications of these differences to the schools. (1406/1963)

Instruction of predictors of programmed instruction error rates and learning rates. (1406/1963)

More research into the problem of individual differences in performance on programmed instruction, and the implications of these differences for the schools. (1406/1963)

Further study to answer this question: How do the factors of category of response term and location of response word in the preceding sentence influence the predictability of the required response and thus influence inspection behavior? (1418/1963)

Further research on what response requirements in programmed instruction lead to complete inspection behaviors. (1418/1963)

Research on whether goal-attainment time does decrease as a function of the degree of group homogeneity. Also, further research on group-versus-individual pacing at other age levels and with different disciplines. (2261/1963)

Further research on an investigation of the effects of the pairing of students to study programmed materials on the motivation and attitudes of the students. (480/1964)

Research to evaluate systematically the effects of spaced review under a variety of instructional conditions. (998/1964)

Research to determine optimal review spacing procedures in programmed instruction when a number of topics are being taught simultaneously. (998/1964)

Further research on the following question: Given the same instructional content, would performance on a corner-clipped looping program and on a linear program be equal for Ss without prior knowledge of the course content? (1278/1964)

Study the "practice factor" in relation to review-versus-new material, and possibly, in relation to the age level of the population for whom the program is written. (1436/1964)

The "discovery" principle in a programmed written instruction manual, and comparison to the conventional manual. (1548/1965)

Research into: (1) the cueing techniques best used for different learners and behavioral outcomes, and (2) to resolve the question of "step-size" to be used for different instructional programs. (61/1966)

Incorporation of both linear and branching formats into a study to determine the compatibility of the two types of programs. (730/1966)

Further research to determine the effect of adjunct programmed instruction on transfer of learning. (1282/1966)

Studies into the influence of programmed instruction upon learning using a random sample of teachers and schools for both the experimental and control groups. (1316/1966)

Study of errorless and dialectical programming, with reference to matrix algebra, on a retention test. (1562/1966)

- Study of deductive and inductive programming methods using a delayed retention test. (2253/1966)
- Survey of programmed instruction use in a variety of industries. (1804/1967)
- Studies to compare success or failure in programmed instruction with individual student characteristics, and to assess which subject area would be most appropriate for programmed instruction. (2358/1967)
- Research on the basis for disagreement between time and error measures in programmed materials. (2579/1967)
- Continued research to determine the type of program the individual learner needs to achieve a particular criterion. (267/1968)
- Study to determine the effects of different feedback conditions upon retention over larger periods of time. (973/1968)
- Further research to determine if users of linear programs should be told to check their answers only when they are not sure of the answers. (973/1968)
- Further experimentation in self-pacing in order that Air Training Command "can progress down the road to true self-pacing." (1160/1968)
- Research to control or measure the novelty effect of the programmed method when being compared to a conventional method. (1262/1968)
- Research to determine whether the detrimental effect of the rule-of-thumb is simply the result of overgeneralization of its use, or whether other factors are involved. (1405/1968)
- Further research on the use of programmed learning materials in classrooms, to provide remedial work for slow learners and advanced work for fast learners. (2210/1968)
- Further studies with a wide variety of programmed materials and with larger groups of subjects, to ascertain if the lower correlations of learning and verbal intelligence on the part of the students studying low-verbal-content programs can be replicated. (728/1969)
- Investigative research on the responsiveness to programmed instruction of highly anxious, under-achieving students. (1375/1969)
- Further investigative research on the performance of paired Ss on non-linear type programs. (1376/1969)
- Further research to study the effect of variation in block size and step size using broader representation of Ss than this particular study (eight grades, mean IQ 116). (1463/1969)

Research to determine whether it is possible to prepare a program with a low blackout ratio for content with which S is generally familiar. (1592/1969)

Replacement of attempts to examine the effects of sequence of learning measures by attempts to write programs which conform to a defined pattern and to develop the appropriate tools for testing these programs. (1983/1969)

Further study on measuring the effectiveness of materials, and the extent of structure in materials themselves. (1983/1969)

Research on the following: Patterns indicative of effective units, appropriate variables for the horizontal axis, and mathematical descriptions of patterns. Also, identification of relevant basic abilities for defined structures, a prerequisite to the meaningful study of effectiveness. (1983/1969)

Implementation of the following in order to fill "gaps" in present literature: (1) devote time to empirical analysis of training systems, (2) study behavior modification, (3) adopt the PI model for every training activity, and (4) measure behavioral outcomes and their interactions with other systems in an organization and learn the differential effects of competing training strategies. (28/1971)

Testing of the effect of modifying study habits upon a group receiving only programmed instruction. (1936/1971)

G. Instructional Devices

Further research on the practicality of utilizing reading-rate controllers and the comparative effectiveness of different approaches to the problem of improving reading skills. (937/1954)

Further validation of specific training devices, where control force is a variable. (2273/1954)

Research to determine whether a reading improvement course in excess of 21 hours utilizing a reading-rate controller would result in improvement in reading speed equal to or greater than that evidenced in a book-centered course. (2625/1954)

Additional research into the complexities of language learning and further exploitation of the language laboratory by interdisciplinary teams. (2671/1962)

Research on training teachers to use an automated classroom. (942/1963)

Further comparative research on the "adjunct auto-instruction" program, and programmed learning methods. (2007/1963)

Further research to test the effectiveness of a self-scoring instructional device in an introductory psychology course, using a sample larger than 52. (1315/1965)

Utilization of the language laboratory in recombining linguistic concepts and recording short stories and plays. (2591/1968)

Continued research to improve educational technology using efforts which permit effective interaction of hardware and software development. (2184/1969)

Investigation of the overall relationship of the factors which go into instruction and administration of a course: (1) what kind and how many of the Army's training requirements are amenable to automated instructional techniques? (2) what kind of instructors or supervisors would be required for partially or fully automated courses? (3) can purely automated courses maintain active student interest over long periods of time? and (4) how can automated courses which emit students individually rather than in groups be meshed together into an integrated training program? (722/1970)

Further research on an expanded computer-controlled teaching machine that will give automated instruction to 20 students simultaneously. (2607/1971)

Research in the following broad areas: the role of modern technology in shaping contemporary Soviet institutions; the human-electronic symbiotic relationships in the Soviet classroom; the role of social engineers in Soviet classrooms; and the Soviet efforts to refine and disseminate the hardware and software needed to automate instruction. (1565/1972)

H. Methods of Instruction

Lecture Discussion

Sharpening of theories and methodology in further research focused on student-centered versus instructor-centered teaching. (2120/1954)

Further research in the general area of improving the teaching of written composition. (1680/1967)

Investigation into the scheduling of note-taking via cues, which could be manipulated by structuring the lecture material. (1757/1968)

Investigation of the relationship between learner achievement and principles of instruction in an experimental design rather than in a correlational context. (1279/1969)

Research to answer these questions: (1) in what ways do (a) length of lecture, (b) method of testing, (c) manner of instruction, and/or (d) isolation effects influence the serial position curve for immediate recall of lecture material? and, (2) do differences in the serial position effect occur as a function of tape recorded versus live lecture presentations? (1333/1969)

Research on a flexible lecture-discussion schedule and its effects on cognitive and affective learning and teacher-student relationships. (971/1970)

Further research investigating student participation in role playing, and comparing the traditional lecture method to taped lectures, movies, television, reading, dialogue, and group interaction. (2480/1970)

Identification and location of sources of supplemental materials for use in independent study. (1580/1972)

Research to determine how much and what kind of reinforcement should be used when employing behavioral objectives with independent learning. (1580/1972)

Studies to replicate this one on the use of behavioral objectives, and independent study with different subject samples. (1580/1972)

Further research to determine whether dependent Ss perform better under a traditional lecture environment than under an independent study plan. (1584/1972)

Further research on the use of adjunct questions in lecture situations. (2421/1972)

Team Teaching

Research to determine the extent to which various aspects of the team system in use at the College of Basic Studies of Boston University account for the unusual degree of scholastic growth shown by students in that program. (789/1964)

Investigation of the relationship between a student's academic performance in a team-teaching situation and his field of concentration. (785/1967)

Investigation into the following questions: (1) what type of course material is most conducive to team-teaching instruction? (2) are high-ability students more receptive to a team-teaching approach than low-ability students; and (3) do team-teaching approaches place differential emphasis on modes of learning as compared with traditional classroom approaches? (1377/1967)

Simulation

Research to ascertain whether there is a significantly greater value in a ground-based trainer cockpit that is an exact replica of the aircraft used in training. (1564/1966)

Determination of the results of using a syllabus that introduces and practices each maneuver and procedure in the trainer before it is introduced in the aircraft. (1564/1966)

Development of evaluation procedures for simulation games. (577/1970)

Studies on: (1) development of the form and content of task information so that output is directly useful in decisions on training device design, (2) formal approaches for determining training value received for equipment costs expended, (3) amount of display degradation tolerance without performance degradation, and (4) transfer of training benefits that accrue from device options that deliberately depart from realism. (519/1971)

Research to compare two or more simulation games which have been developed to teach the same facts, abilities, and skills. (575/1971)

Research to determine the advantages or disadvantages of using simulation games with disadvantaged and/or non-verbal subjects. (575/1971)

Tutorial Instruction

Research to investigate the characteristics of those students who fail and those who succeed in a tutorial program. Also, study of the variability which exists within a tutorial program itself. (1924/1967)

Research to determine the role motivation plays in academic performance. What results would be found if the tutored were matched with a tutor-motivated sample which was denied tutoring? (1892/1969)

Research into the effects of a remedial tutorial program using a large sample, and making subject-by-subject comparisons. (1892/1969)

I. Media Comparisons

Research to compare tape-recorded instruction versus more conventional correspondence courses. (2237/1962)

Further research to: (1) test the feasibility of the guidelines proposed in this study, (2) identify heuristic principles available to evaluate the role of the media specialist, (3) build a research-hypotheses generating mechanism into the course development procedures to identify

unknowns particular to this process and make possible more integrated and applicable research, (4) explore the nature of training programs for specialists in instructional design and media applications to teaching, and (5) disseminate the findings of successful media innovations and instructional developments, to broaden the base of these efforts and deliver their benefits to more universities and colleges. (529/1965)

Improvement in future media research to obtain either situation-specific findings or generalizable principles. Also, creation of a "media taxonomy" listing commonly known and unusual features, stimulus dimensions, and functions to be served by the various media. (16/1966)

Replication of this study utilizing additional treatment conditions of program-program, text-text, and lecture-lecture in order to investigate more thoroughly the effects of repetition on learning. (730/1966)

Research to answer these questions: How does one medium interact with other media, different types of learners, different types of teachers, and different class sizes? To what extent can media assume the instructional function? What administrative patterns and arrangements are appropriate in schools committed to a technology of instruction? (1674/1966)

Research to determine the effect of dial-access retrieval on: (1) student learning (grades and performance), (2) study patterns, (3) role of teacher and use of time, (4) curriculum, (5) methods, (6) role of library, and (7) cost-effectiveness. (661/1968)

Research to investigate the potential of developments in compressed speech, single-concept films, and programmed media, and their effects on dial-access systems. (661/1968)

Research on the integrated use of dial access with other modern instructional technologies, such as instructional TV, radio, computers, electronic response systems, etc. (661/1968)

Further data on cost-effectiveness of various media. (1197/1968)

Research on more effective utilization of various combinations of media. (1197/1968)

Analysis of motion picture and TV research in terms of current production and utilization data. (1722/1968)

Research into the relationships between unique media attributes and their physiological functions under specific task requirements and specific learners. Also, continued research on four effects of mass communication: (1) aptitudinal, (2) attitudinal, (3) emotional, and (4) social. (247/1970)

Investigation into the following: (1) traditional nature of instructional content, (2) effectiveness of various media, (3) teacher training, (4) student attitudes (motivation, self-reinforcement), (5) determination of learning experiences of value, and (6) efficiency and cost-effectiveness of instruction. (59/1971)

Further investigation of the interaction between aptitude and type of modeling treatment (written versus video) as teacher training using refined aptitude and treatment variables and data such as consideration of cost factors. (2006/1971)

Media comparison studies which use different forms of dependent measures to measure learning. (698/1972)

Media comparison studies using many of the unique contributions of TV simultaneously, rather than a single dimension at a time. (698/1972)

Investigation into the relationships of visual TV communications techniques to theoretical models of perception and learning. (698/1972)

Testing of color versus black-and-white effects on learning, opinion, and attention with other stimuli, other media, and other methods of observing the attention variable (such as recording eye movements). (714/1972)

DEVELOP INSTRUCTIONAL MATERIALS

The research needs related to this process have been divided into three categories. The category "Learning Theories" includes discussions and suggestions for research on psychological learning theories, such as behavior modification and behavior acquisition models. The "Instructional Techniques" category includes needs for research on topics such as the value of lecture versus discussion and recitation versus written tests. Included in the last category, "Factors Affecting Learning," are research suggestions ranging from the effects of test anxiety to the problem of retroactive inhibition.

A. Learning Theories

Study of the problem-solving processes involved in concept learning. (2121/1957)

Research to determine whether observed differences in concept learning between searching and dependent groups were due to motivational characteristics. (2121/1957)

Research into possible differential expectancies toward the experimenter's validation responses in relation to concept learning. (1918/1962)

Further research in language learning, following the pattern of analysis of verbal behavior suggested by B. F. Skinner. (1390/1963)

Development of meaningful terminology and labels (in addition to the important but general term "reinforcing stimuli") to describe and classify the stimulus variables employed in research on discovery learning. A sophisticated theory of concept formation is needed, not only to supply these terms and labels, but also to account for phenomena observed in research on learning by discovery. (1824/1963)

Research to determine whether specific sorts of feedback are needed to make specific kinds of decisions. (1439/1967)

Research to operationally define, experimentally, terms such as "cybernetic control," "criterion stimuli," and "negative feedback," and demonstrate how these events interact in an educational context. (1692/1968)

Further research on problem-solving strategies, rather than problem-solving choice responses. (1318/1969)

Research into the relationships between unique media attributes and their physiological functions, under specific task requirements and for specific learners. Also, continuation of research on four effects of mass communication: (1) aptitudinal, (2) attitudinal, (3) emotional, and (4) social. (247/1970)

Research to determine what kind of learning activities can be made contingent upon the discriminative text cues that are defined by questions. (1048/1970)

Research directed "toward the studies of stimulus encoding processes, retrieval from short-term memory and long-term memory, stimulus redundancy and between-channel redundancy, and the disinhibition process of proactive and retroactive inhibitions." (693/1971)

Research on schedules of reinforcement, the immediacy of the incentive provided, the curriculum step-size, and the reward contingent on the successful performance of each step. (1256/1971)

Research into the post-passage review or "backward" hypothesis of learning-- i.e., that questions inserted into a unit of instruction motivate the student to review the preceding material in that unit. (1932/1971)

Research on the efficacy of the forward or shaping influence hypothesis-- i.e., that questions inserted into a unit of instruction influence the way in which further materials in that unit are studied. (1932/1971)

Research to determine the type of concepts that can be learned most efficiently through the use of behavioral objectives. (1580/1972)

B. Instructional Techniques

Research to examine specific characteristics of various teaching methods as independent variables, in addition to the overall method taken as a single independent variable. (1319/1963)

Study of the reliability of the stimulated response technique via a test-retest situation. (1803/1963)

Investigation of differences in the relevant thought stimulated by different subject areas. (1803/1963)

Additional study of constant delay of reinforcement. There is no study of the relationship between a range of possible competing response (as one type of interference) and resistance to extinction. Also, research is needed into the effectiveness of delayed punishment versus delayed reward which has also not been explored. (424/1964)

Investigation of how personality variables influence the efficiency of teaching methods. (1725/1964)

Investigation of the hypothesis that the method of instruction has different effects on different ability groups. (1725/1964)

Further testing of the hypothesis that anxiety seems to have no effect on learning. (1725/1964)

Investigation to ascertain the relative merit of explanatory versus non-explanatory reinforcement, as measured by performance on objective examinations. (1763/1965)

Research into: (1) the cueing techniques best used for different learners and behavioral outcomes, and (2) to resolve the question of "step-size" to be used for different instructional programs. (61/1966)

Research to determine how best to encourage teachers to utilize curriculum guides. Is having them participate in the construction of the guides helpful? (1676/1966)

More study of complex motor activity, involving not only the execution of the individual motor components, but also their periodic assessment as the S moves through the entire sequence of the task. (1670/1967)

Studies to determine which aspects of a complex motor skill can be learned through mental practice, and which cannot. (1670/1967)

Research on the use of a different cueing procedure, such as sound intensity, light intensity, both, or a combination of cues to maintain student attention. (1757/1968)

Investigation into the scheduling of note-taking via cues, which could be manipulated by structuring the lecture material. (1757/1968)

Research to answer these questions: Why is the recitation method so successful in the evolutionary struggle with other, more highly recommended methods? What survival needs of teachers are uniquely met by the recitation? Why have teacher training institutions been unable to defer teachers from using recitation? Is recitation the best or most practicable pedagogical method? (1072/1969)

Research to test Ausubel's hypothesis that discovery learning is more relevant to children, and reception learning is more relevant to older students. (1640/1969)

Research on transfer of training over periods in excess of six weeks, in discovery learning. (1640/1969)

Research to determine the relevance of Gagné's categories of learning to the discovery method. (1640/1969)

Research to examine savings on relearning in discovery learning. (1640/1969)

Study of feedback methods, with the addition of a delayed retention measure. (2142/1969)

Study to contrast the use of different cloze techniques in reading instructions. (2439/1969)

Further research on a word-association technique for a military radar maintenance course. (554/1970)

Extension of the consciousness-sampling method across a variety of topics and themes. (791/1970)

Development of a taxonomy of teaching behaviors, and simulated classroom situations focusing on these teaching behaviors. (1285/1970)

Investigation of the possibility that subject-produced responses may cause proactive or retroactive interference. (1302/1970)

Research on identification and shaping of specific methogenic or attention-like behaviors through the use of properly structured material. (1985/1970)

Research to attach practical significance to the results of instructional-technique/individual-differences types of studies. (854/1971)

C. Factors Affecting Learning

Research to determine if verbal description without performance and/or verbalization over more than one trial would exert a positive effect on the ability of a learner to perform a task. (2223/1952)

Investigation of the effect of length of summary and introductory sequences on learning. (755/1953)

Further research to substantiate the hypothesis that retroactive inhibition makes an important contribution to the forgetting of meaningful material. (995/1955)

Use of a population different from that in the present study, to examine the effect of organizational aids on comprehension and retention. (2077/1955)

Further research in reading improvement, considering variables such as personality structure-learning interaction, perceptual development, and treatment variables (especially the instructor). (2079/1955)

Research to determine the effect of temperature upon technical training in industrial and other civilian situations. (2179/1955)

Further research on the relationship of style difficulty to retention, especially where "compensation" may be a factor. (2199/1955)

Research into possible differential expectancies toward the experimenter's validation responses in relation to concept learning. (1918/1962)

Additional research to examine the scrambled-versus-ordered sequence question with students of various age levels, with programs of different length and in different subject areas, and with retention tests made at spaced intervals of time. (1920/1962)

Systematic research into response-mode effects with controls for program length and length of retention interval. (1368/1963)

Research to determine whether or not students with higher entering behaviors than that of a course's target population can be instructed to make covert responses. (1378/1963)

Investigations to determine the most efficient use, with regards to time, of overt and covert responding. When is it best to require the overt response, and when is the information level high enough? (1378/1963)

Research utilizing an informational approach in studying incidental learning. (1378/1963)

Additional study of constant delay of reinforcement. There is no study of the relationship between a range of possible competing response (as one type of interference) and resistance to extinction. The effectiveness of delayed punishment versus delayed reward has not been explored, and is recommended as an area for research. (424/1964)

Additional research to measure the authoritarianism/achievement relation in the learning of students in industrial training classes. (479/1964)

Research to investigate the degree to which the adroit timing of exposure in different sense modalities can facilitate learning, as a function of different linguistic problems and differences in individual learning ability. (1791/1964)

Further investigation to study the effects that long-term training with ambiguous stimuli has on discrimination of unambiguous stimuli. (1350/1965)

Further investigation to determine the effect that controlled variation of figure ambiguity throughout training has on discrimination of figures. (1350/1965)

Investigations of modifiable monitoring behavior, to precede future research on perceptual training methods. (1102/1966)

Further investigative studies on complex perceptual tasks. (1102/1966)

Empirical examination of the concept of data display complexity in a target detection task. (1102/1966)

Research to determine which condition corresponds with the greater job output--knowledge of results given after doing the task for some time, or knowledge of results given from the time the task is first begun. (1290/1966)

Investigations of the effect that knowledge of performance has on job output, using larger samples to reduce inter-individual variation. (1290/1966)

Continuation of research on the exact mechanism by which learning behaviors are modified by questions appearing immediately after the text. (779/1967)

Research to determine if different limits of learning using accelerated speech result from distributing learning over a greater span of time (such as 30 minutes). (1957/1967)

Determination of the effects of presentation order of advanced organizers. The question of how learning efficiency depends on the order of presenting abstractions and concrete models of these abstractions is important to curriculum reformers in mathematics and should be investigated experimentally. (1963/1967)

Additional research in these areas: (1) what specific elements of the mnemonic system are responsible for facilitating recall? (2) what external variables influence the performance of Ss using a mnemonic system? (3) would the use of imagery or mediation facilitate the recall of Ss as compared with a control group given standard paired-associate instructions? (4) does presentation of a peg-word list facilitate learning a word list which requires a considerable amount of response learning? (5) what is the rate of recall for Ss learning a single list with different presentation rates under mediation or nonmediation instructions? (6) how effective is a mnemonic system in learning more complex material? and (7) what is the long-term retention of material learned by means of a peg-list approach? (2430/1967)

Research to determine if cues such as delayed information have any effect on immediate and delayed retention. (803/1968)

Study of the effects of different feedback conditions upon retention, over larger periods of time. (973/1968)

Research into what forms psychometric feedback should take, so as to produce the best effects. (1395/1968)

- Investigation of the hypothesis that when task-appropriate behaviors do not exist in S's repertoire, postquestions would selectively reinforce the more appropriate behaviors. This instrumental learning should be reflected in a gradual improvement of the posttreatment over the pre-treatment groups over time. (1399/1968)
- Research to determine whether the detrimental effect of the rule-of-thumb is simply the result of overgeneralization of its use, or whether other factors are involved. (1405/1968)
- Further experimentation to test the effect of specific variations in treatment. For example, under what conditions is informational feedback of great help and under what conditions does it interfere with learning? What does a graduated sequence of information take if feedback is to be of greatest help? How does increasing the length of the scenes to include a greater number of observed behaviors influence the observer's performance? (1971/1968)
- Further investigation of the relevant behaviors which underlie or strongly interface with skillful observation of intended pupil performance may be profitable. (1971/1968)
- Research to determine the effects of the rank and general attitude of the class leader on performance in a military training class. (2418/1968)
- Research to determine the effect of competition groups (formed on the basis of peer ratings) upon student performance. (2418/1968)
- Research to determine the effect on performance in a military training class of making exams more or less difficult during the first weeks of training. (2418/1968)
- Further research on instruments to measure learner characteristics other than achievement, and development of a variety of materials designed to meet the individual learning styles of the student. (2489/1968)
- Studies of goals and intentions as a function of the incentives provided by E. (1080/1969)
- Studies of the form of incentives given to Ss as they relate to motivation. (1080/1969)
- Experimental study of the differential effects of familiarity of "things," "actions," and "relations" recall of meaningful propositions. (1310/1969)
- Research to determine whether the post-TLE decline on latency is actually indicative of the growth of associative strength. (1338/1969)
- Research to determine if the degree of retention can be controlled by training to a latency criterion. (1338/1969)

Research to determine latency changes over the course of learning in more complex tasks, such as concept formation. (1338/1969)

Research to determine if latency measures have utility for instructional decisions in the early stages of the task. (1338/1969)

Research to determine if response latencies reach a stable asymptote, and if so, whether this asymptote has any implications for retention. (1338/1969)

Research to answer the question, "Does low homogeneous ability pairing provide an optimal condition for learning conceptual materials during a brief exposure?" (1392/1969)

Further study to investigate the hypothesis that with delay of Information Feedback following a S's response, the S responds to the presentation of additional cues or stimulus aspects of IF, thus learning more about the item; and that when these cues can be used in retention, delay improves retention. (1412/1969)

Research into the effect of variables, such as semantic or syntactic transformations and irrelevant information, on productive and reproductive memory. (1016/1970)

Research to determine what kind of learning activities can be made contingent upon the discriminative text cues that are defined by questions. (1048/1970)

Research on these questions: What are the more critical student activities that affect what is learned in the more important institutional settings? What are the factors that modify mathemagenic activities? What causes positive mathemagenic activities to deteriorate? How can one give a coherent account of Class III activities that is consistent with what is known about visual perception, memory, and language processes? (1050/1970)

Research on delineating and/or relating considerations of some of the following variables which may be associated with the learning set of individuals: instructional content, instructional strategy, various learner characteristics, and/or levels of student cognitive functioning. (1186/1970)

Research to determine the effects of formal training on strategies used in concept attainment. (2610/1970)

Research investigating the effects on learning of pairing students when students choose their own partners. (699/1971)

Further research to investigate the effect of feedback stimuli on the learning of the teacher who is instructing a responding learner. (763/1971)

- Further research to examine various teaching-learning processes to determine additional benefits of a teaching experience on the learning of the teacher, and to analyze those benefits into the appropriate sources of transfer. Possible benefits are strategies of responding, rate of responding, and types of errors and correct responses. (763/1971)
- Further research to demonstrate the generalizability of the effects of using a warning as an instructional strategy, by using different subject matters or problem solving situations. (823/1971)
- Research to determine if vicarious reinforcement can be used to increase performance in academic settings. (1064/1971)
- Investigation of the effects of labeling stimuli and S-R contingencies in training and extradimensional-constant transfer after different amounts of training. In this context, it would be useful to investigate the relationship of labeling, discrimination of change between training and transfer, and the commission of perseverative errors to the previously relevant training cue and dimension. (1608/1971)
- Research to determine whether the learning consequences of an instructional aid react differentially upon various components of the instructional episode. Does the use of an inferential adjunct question tend to cause recall of so much text material that it interferes with the recall of the question itself? Does such interference diminish if the text is learned more completely? (1995/1971)
- Research to determine if it is possible to provide irrelevant information to Ss to cause them to search for new and better ways of discovering rules--a positive effect of irrelevant information. (1998/1971)
- Study to determine whether having Ss skim through material they have read once improves their mastery of the subject matter to the same level as working an instructional program. (2003/1971)
- Investigations to determine if familiarity with subject matter could be a useful predictor of optimal instructional strategies. (2003/1971)
- Investigations into the possible relationships that may exist between type of prior reinforcement given and other organismic variables. (2010/1971)
- Research to determine whether one can inhibit or facilitate S performance in academic and non-academic settings, by variation of the nature of the information given the S concerning his potential for performance in a given area. (2010/1971)
- Further study on the effects of informal verbal feedback on self-perception during sensitivity training. (2144/1971)

Studies on the relationship between teaching methods and the area of principles learning, using teachers trained in the particular methods to be used. (2147/1971)

Research to explore the relationship on procedure learning of the factors of unfamiliar movements and verbal codable movements with moving and still sequences. (2195/1971)

Investigation of the relationships between the three variables--augmentive information, instance difficulty, and method of presentation--in terms of the amount and type of information being presented by the instances, what types of learner strategies are employed, and the degree of task complexity. (896/1972)

Research in educational and applied learning situations to determine whether the principle that intratask interference during learning facilitates retention and transfer can be generalized to nonlaboratory situations. (956/1972)

More research to provide a sound foundation in the experimental analysis of human academic learning. (976/1972)

Future research to explore ways to maximize the effects on learning of complex combinations of variables, including objectives. (2165/1972)

Evaluation of the Internal-External Control task setting with a variety of social and ethnic groups. (2510/1972)

Research to determine the effect of different question construction (type, content, or form of question) on learning of textual material. (2393/1973)

EVALUATE INSTRUCTIONAL PROGRAM

Included in this category of research needs are suggestions for evaluation of the instructional program. Research needs were further divided into determining the effects of instructor, student and environmental factors because it was determined that outside factors, rather than the actual content of the program, may hinder or facilitate program effectiveness.

A. Analyze/Evaluate Program Data

Definition of the range of variables and measures to serve as the bases for program evaluation. (1728/1968)

Study on adapting the methods of the social and behavioral sciences to educational evaluation. (1052/1970)

Prototypical studies using matrix sampling and generalizability theory in educational evaluation. (1052/1970)

Regular evaluation of the relevance of technical curricula to the educational input into the labor market. (1104/1970)

Research to develop more refined forecasting techniques, especially those used to identify the impact of technological changes on skill requirements and demand for labor. (1104/1970)

B. Evaluate Instructors

Instructor Effectiveness

Investigation of the following questions: (1) what is the comparative effectiveness of certified versus uncertified trainers? (2) does a warm and friendly trainer produce a more self-initiated and work-oriented student? (3) what is the effect of social competence on overall training competence? and (4) what trainer characteristics are related to the competence of a trainer, as reflected by measurable changes in trainee behavior? (1383/1967)

Research to determine why engineering students prefer instructors who lecture, and who conduct factually oriented, controlled classes. Is it because this style is particularly suited to the course material, or because the instructors consider it to be the most appropriate style, or because the style is supportive of the personal needs of the instructors? (1018/1970)

Evaluation of instructor rating systems to determine if they are truly related to important educational criteria, such as student achievement in the school and student performance on the job. (711/1970)

Further testing to investigate the idea of teacher evaluation as an estimation of discrepancies between ideal and observed behaviors. (2014/1971)

Investigation of the questions "for which objectives?" and "for which students?" in order to answer the question "which teachers are most effective?"

Personality Variables

More research to determine the interaction between student personality and specific teacher-student interview techniques. (989/1956)

More research to determine the types of teachers who could succeed in teacher-student interviewing. (989/1956)

Research to answer the following questions: (1) what is the efficacy of various teaching methods independent of the teacher's individual personality? (2) in what ways do different teacher personalities enhance or detract from various instructional methods? (776/1962)

Research to answer the following questions: (1) what is the relationship between the actual progress of a student as measured by standardized tests, and the instructors ratings? (2) in what ways are instructors' perceptions of students affected by personality variables? and (3) is the way that an instructor grades a student related to that instructor's own personality characteristics? (2355/1965)

Investigation of these questions: Can teacher trainees whose conceptual systems are at lower stages of development be taught to use a reflective teaching style in classroom teaching performance? What conditions are sufficient to effect such a change? (1074/1970)

Research to determine the extent to which the study results (student behavior influences teacher behavior in predictable directions) generalize to other non-education courses, with regular (not guest) teachers. Consider research in which (1) input variables such as student and teacher characteristics which the individual possesses before entering the class, (2) verbal and non-verbal cognitive and affective student and teacher classroom interactions, and (3) student and teacher products measured after a designated interval. (2030/1971)

Training of Instructors

Increased research in the use of nonprofessionals in selection and training procedures, relationship with teachers and students, aids effectiveness at various tasks, and resultant changes in teacher work patterns. (1010/1967)

Study of preservice-inservice relationships, teacher role differentiation, programs for teachers of culturally disadvantaged youth, and programs built around the integrated use of newer media. (1012/1967)

Research to contrast teachers who have been thoroughly trained in the use of behavioral objectives with an untrained group of teachers on the basis of their students' achievement. (1767/1969)

Research into the application of suitable contingency models for reinforcing measured changes in student behavior. (1767/1969)

Study of the relationship between teaching methods and the area of principles learning, using teachers trained in the particular methods to be used. (2147/1971)

Continuation of research on the educational value of the individualized competency-based system of teacher education described in this document. (2586/1972)

C. Investigate Student Characteristics

Research to determine if students whose low verbal-aptitude scores are apparently due to poor reading ability, can improve their verbal-aptitude scores after a period of intensive instruction in reading. (1916/1963)

Further study to determine if persons who make great gains in a reading improvement course are those persons whose initial reading scores are low and who are emotionally stable and non-anxious. (1916/1963)

Research to determine which types of students are apt to benefit most from an independent study approach to education. (833/1966)

Research in these areas: (1) what kinds of subject matter are most appropriate for use of the overhead projector? (2) what student characteristics would indicate particular receptivity to the use of the overhead projector as a supplement to instruct? and (3) to what extent does the use of visual aids engender an "illusion of learning" among students? (2151/1967)

Further research to directly test the hypothesis that decline in inspection time is directly related to a lessening of mathemagenic (attention-like responses) behavior resulting in diminished learning effects. (1273/1968)

Replication of the entire series of studies on classroom climate and individual learning, with revised and more reliable instruments, and using a national random sample. (1409/1968)

Research to identify the variables along which student attitude toward instructional media are differentiated. (1570/1968)

Research on the effects of the environment, traced on individual learners grouped by mental ability, biographical characteristics, and personality. (1306/1969)

Research to identify experimentally manipulated factors and status variables which affect the social environment. (1306/1969)

Comprehensive and systematic research on affective variables in academic achievement. (1352/1969)

Development of instruments which differentiate between the self-description and self-evaluation aspects of self-concept. These should then be related to various criteria, to ascertain the relative effectiveness of the two domains. (1035/1970)

Development of instruments to assess self-perceptions of past and future and to determine their strength in predicting academic success. (1035/1970)

Research in the area of self-perception as a predictor of academic success for women. Why do women's perceptions of themselves not relate to their performance? (1035/1970)

Research on the following questions: What are the more critical student activities that affect what is learned in the more important institutional settings? What are the factors that modify mathemagenic activities? What causes positive mathemagenic activities to deteriorate? How can one give a coherent account of Class III activities that is consistent with what is known about visual perception, memory, and language processes? (1050/1970)

More research to develop techniques for developing positive attitudes and modifying negative attitudes toward mathematics. (1660/1970)

Longitudinal studies on attitudes toward mathematics, and studies utilizing multivariate designs which combine the correlational and experimental approaches. (1660/1970)

Further research on the effects of class characteristics on learning. (1990/1970)

Research to explore sex-differentiated effects of the peer group in school classes. (1990/1970)

Further research focused on class subgroups to determine the effects of subgroup characteristics on learning. (1990/1970)

Research to determine whether students participating in a performance contract-individualized instruction type of program have poorer achievement when allowed to select their own contracts on the basis of preference than when contracts are presented in a formal sequence. (2385/1970)

Further research attaching practical significance to the results of instructional-technique/individual-difference type of studies. (854/1971)

Research to measure the interaction of student opinion and the grade level for which the student contracted in grade-contract situations. (862/1971)

Research into individual differences in processing listening materials. The method of speech compression could be utilized to equate the performance of high- and low-aptitude Ss, thus allowing for the study of differences in the type of information transmitted. (961/1971)

Additional research to discover what variables (besides achievement orientation) are of interactive significance to academic achievement. (1926/1971)

Research to determine the extent to which the study results (student behavior influences teacher behavior in predictable directions) generalize to other non-education courses with regular, not guest teachers. Consider research in which input variables, such as the following are considered: (1) student and teacher characteristics which the individual possess before entering the class, (2) verbal and non-verbal cognitive and effective student and teacher classroom interactions, and (3) student and teacher products measured after a designated interval. (2030/1971)

Systematic exploration of the relationship of the interest and attitude of the learner toward subsequent learning, with appropriate dependent variables. (698/1972)

Additional research to assess the ways in which individual-differences data, as related to some given material to be learned, may be used in a manner most accommodating to the needs of the individual student. (756/1972)

D. Investigate Effects of Student-Instructor Interactions

More research to determine the types of teachers who could succeed in teacher-student interviewing. (989/1956)

More research to determine the interaction between student personality and specific teacher-student interview techniques. (989/1956)

More research to determine the effects of teacher-student interviews on the performance of borderline achievers. (989/1956)

Research on the extent to which the amount or kind of participation by the more social student may vary with the instructor's presence or absence in group discussions. (1673/1960)

Research to answer the following questions: (1) what is the relationship between the actual progress of a student as measured by standardized tests, and the instructors ratings? (2) in what ways are instructors' perceptions of students affected by personality variables? and (3) is the way that an instructor grades a student related to that instructor's own personality characteristics? (2355/1965)

Assessment of the individual aviation instructor's total influence on student achievement. (1564/1966)

Increased research in the use of nonprofessionals in selection and training procedures, relationship with teachers and students, aids effectiveness at various tasks, and resultant changes in teacher work patterns. (1010/1967)

Research devoted to discovering aspects of the individualized systems approach that would alleviate student feelings of isolation. (793/1970)

Further investigation to relate teacher behavior with resulting student performance. This should use an observational system (rating or category) and measures of class achievement adjusted for initial aptitude or ability. (1054/1970)

Further research on the effects of teacher attitudes on student attitudes. Methods used in this area should involve direct observation of teacher-pupil interaction and measures of teacher expectations in mathematics. (1660/1970)

Continuation of research in the area of student-teacher personal interaction, including larger sample sizes and using formal records of both student- and teacher-initiated student-teacher personal interactions. (1711/1971)

Research to determine the extent to which the study results (student behavior influences teacher behavior in predictable directions) generalize to other non-education courses with regular (not guest) teachers. Consider research in which input variables, such as: (1) student and teacher characteristics which the individual possess before entering the class, (2) verbal and non-verbal cognitive and affective student and teacher classroom interactions, and (3) student and teacher product measured after a designated interval. (2030/1971)

E. Investigate the Effects of the Learning Environment

Replication of the entire series of studies on classroom climate and individual learning, with revised and more reliable instruments and using a national random sample. (1409/1968)

Research to identify experimentally manipulated factors and status variables which affect the social environment. (1306/1969)

Study of the environment, traced on individual learners grouped by mental ability, biographical characteristics, and personality. (1306/1969)

Pilot testing to determine at what point, if any, the observer is forgotten and the "natural" classroom situation emerges again. (1326/1969)

Research into person-environment interactions on college campuses. (2222/1969)

Research to answer this question: Can the class composition be manipulated with respect to the biographical characteristics of its members to achieve an optimal learning environment for each student? (1026/1970)

Research to examine the dynamics and behavior of students as they interact and perform in two types of college environments--"impersonal" and "supportive." The following hypotheses are offered: (1) a highly independent student would do equally well in either environment, (2) a dependent student would do best on a "supportive" campus, and (3) a dependent student of high ability would perform better at an "impersonal" campus than would a dependent student of low ability. (1030/1970)

Research on the following questions: What are the more critical student activities that affect what is learned in the more important institutional settings? What are the factors that modify mathemagenic activities? What causes positive mathemagenic activities to deteriorate? How can one give a coherent account of Class III activities that is consistent with what is known about visual perception, memory, and language processes? (1050/1970)

Determination of the efficacy of peer influence and vicarious reinforcement procedures in effecting behavior change in a classroom setting. (764/1971)

Research to determine whether the effects of the physical environment wash out when the error variance is set up to be carefully observed. There may be more consistency in response within Ss than within rooms. (1668/1971)

Study of the effects of a complete honor system, and the trust implied by such an honor system, on the attitudes, values, and behaviors of various kinds of students. It may then be possible to delineate the kind of educational atmosphere most conducive to the growth and strengthening of academic responsibility and intellectual values. (2032/1971)

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